60130-1293
00MRA0037

UNITED STATES PATENT AND TRADEMARK OFFICE

#8

Applicant: Mark Graham Lawrie, et al.

Serial No.: 10/010,739

Filed: December 6, 2001

Priority: GB 0030097.0 Filed: December 9, 2000

Group Art Unit: 3635

Examiner: Unknown

Title: ASSEMBLY

TRANSMITTAL OF CERTIFIED COPY

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

With regard to the above-referenced patent application, enclosed is a Certified Copy of prior corresponding document GB 0030097.0 filed December 9, 2000.

Respectfully submitted,

CARLSON, GASKEY & OLDS, P.C.

Karin H. Butchko
Registration No. 45,864
400 W. Maple Road, Suite 350
Birmingham, MI 48009
(248) 988-8360

Dated: April 4, 2002

CERTIFICATE OF MAILING

I hereby certify that this correspondence and Certified Copy are being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Assistant Commissioner of Patents, Washington D.C. 20231 on April 4, 2002.

Raimi Blackerby

PATENTS • DESIGNS • COPYRIGHT • TRADE MARKS
The Patent Office

INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

Signed A M Brewer.

Dated 12 December 2001

CERTIFIED COPY OF PRIORITY DOCUMENT

Patents Act 1977
(Rule 16)

The Patent Office

1/77

THE PATENT OFFICE
J
-9 DEC 2000
NEWPORT

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office
Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference JBJ/P300338GB

2. Patent application number *(The Patent Office will fill in this part)* **0030097.0** 09 DEC 2000

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Meritor Light Vehicle Systems - France
105 Route d'Orleans
B.P. 48
Sully-sur-Loire
45600
France

11DEC00 E590354-6 D01038
P01/7700 0.00-0030097.0

Patents ADP number *(if you know it)* 799248 0001

If the applicant is a corporate body, give the country/state of its incorporation: France

4. Title of the invention: Assembly

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

WITHERS & ROGERS
Goldings House
2 Hays Lane
London
SE1 2HW

Patents ADP number *(if you know it)* 1776001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(answer 'Yes' if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

YES

Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	10
Claim(s)	4
Abstract	
Drawing (s)	3

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	One
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature J B Jones Date 8 December 2000

12. Name and daytime telephone number of person to contact in the United Kingdom: John B Jones 0121 245 3900

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least six weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500 505.*
b) *Write your answers in capital letters using black ink or you may type them.*
c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*
d) *If you have answered 'Yes' Patents Form 7/77 will need to be filed.*
e) *Once you have filled in the form you must remember to sign and date it.*
f) *For details of the fee and ways to pay please contact the Patent Office.*

JBJ/P300338GB

ASSEMBLY

The present invention relates to assemblies, in particular assemblies having two components secured together by a deforming process, such as heat staking, mechanical deforming or methods using ultrasonics. The assemblies may require the location and subsequent securing of a further component.

In particular the invention is applicable to providing an assembly of a door panel, a window regulator housing and a window regulator motor of a land vehicle such as a car (automobile).

Many methods of securing components are known, amongst which is the technique of passing a thermoplastic protuberance from one component, through a hole in a second component and subsequently heating and upsetting the protuberance to form a rivet-like head and allowing the rivet like head to cool. This technique, is known, and is called heat staking. After cooling, a secure connection between the two components is established, the two components now forming a heat staked subassembly. However, the formation of the rivet-like head potentially obstructs the subsequent alignment and fitting of a further component to the heat staked subassembly.

An object of the present invention is to provide an improved assembly which enables a further component to be secured to and/or aligned with a subassembly.

Another object of the present invention is to provide an assembly wherein the components of the assembly can be aligned relative to each other.

Another object of the present invention is to provide an assembly wherein a deformed portion does not interfere with alignment or fitting of a further component.

Thus, according to the present invention there is provided an assembly including a first, second, and third component, the first component being secured to the second component by a deformed portion to provide a subassembly, in which the third component cooperates

with the deformed portion to provide alignment between the second and third components.

According to another aspect of the present invention there is provided an assembly including a first, second, and third component, the first component being secured to the second component by a deformed portion to provide a subassembly, in which the deformed portion is utilised to secure the third component to the sub assembly.

According to another aspect of the present invention there is provided an assembly including a first, second, and third component, the first component including a feature which ensures alignment between the first and second components, the feature being utilised to secure the first component to the second component by a deformed portion to provide a subassembly in which the third component cooperates with the feature to provide alignment between the second and third components.

According to another aspect of the present invention there is provided an assembly including a first component and a second component, the second component having a recess, with the first component being secured to the second component by a deformed portion, in which the recess includes the deformed portion.

The invention will now be described, by way of example only, with reference to the accompanying drawings in which:-

Figure 1 is a schematic view of a door panel and a window regulator housing according to the present invention prior to assembly,

Figure 2 shows the components of Figure 1 after alignment,

Figure 3 shows the components of Figure 2 after the application of heat an upsetting tool,

Figure 4 shows the components of Figure 3 and a window regulator motor.

Figure 5 shows a further embodiment of the present invention.

Figure 6 shows a further embodiment of the present invention.

Figure 7 shows a further embodiment of the present invention.

With reference to Figure 1, there is shown a door panel 12 (also known herein as a first component) and part of a window regulator housing 14 (also known herein as a second component).

The window regulator housing 14 might typically contain a drum around which has been wound a cable, rotation of the drum causing movement of the cable and hence raising or lowering of the window glass via separate components of the window regulator.

Note that the present invention is not restricted to window regulators containing drums with cables.

The door panel 12 can be in the form of a door inner skin, i.e. a pressed component having various holes and attachments features for components such as door hinges, door latch, audio speakers, window regulator components etc.

Alternatively the door panel 12 can be in the form of a door module i.e. a panel onto which is pre-mounted various components such as window regulator components, and audio speaker, a door latch etc. with this pre assembled door module being mounted in a relatively large aperture of a door inner skin.

Alternatively the door panel 12 can be a panel plate, such as a window regulator mounting plate, onto which parts of a window regulator are mounted.

Consideration of Figure 1 shows that the door panel 12 includes a feature in the form of a protrusive part 18, the protrusive part comprising a cylindrical portion 20, and frustoconical portion 22. The protrusive part 18 has an inside surface 23 and an outside surface 21.

The door panel 12 has an outer surface 24 and an inner surface 39.

The window regulator housing 14 includes a recess 32, the boundaries of the recess 32 defined by internal side wall 30 and a projecting cylinder 26, the internal side walls 32 having substantially the same form as the outside surface 21 of the protrusive part 18 of the door panel 12.

The window regulator housing 14 has an inner surface 34.

Further consideration of Figure 1 shows that the height of the projecting cylinder 26 is such so as to prevent the projecting cylinder 26 from engaging in the hole in the protrusive part 18 before the cylindrical portion 20 has engaged in the side wall 30 of the recess 32, i.e. the dimension D_2 is greater than the dimension D_1. This ensures that during alignment of the window regulator housing 14 and the door panel 12, the projecting cylinder 26 is not damaged by engagement with the frustoconical portion 22 of the protrusive part 18 as these parts are assembled. It can be seen that cylindrical portion 20 of the feature (protrusive part 18) engages side wall 30 (and hence aligns the first and second components) whilst the (pre deformed) cylinder 26 is remote from the frustoconical portion 22.

It can be seen from Figure 2 that the engagement between the recess 32 and the protrusive part 18 and the engagement between the inner surface 34 and the outer surface 24 provides alignment of the window regulator housing 14 and the door panel 12 in both the X, i.e. fore and aft, and Y, i.e. lateral direction relative to the vehicle.

Consideration of Figure 3 shows that it is possible to provide a deformed portion by applying both heat, and a suitable upset tool to the cylinder 26, which results in a heat staked portion 28 being formed in the recess 32. The heat staked portion 28 forms against the frustoconical portion 22 of the door panel 12, providing a secure and sealed connection between the window regulator housing 14 and the door panel 12. The connection of the door panel 12 and the window regulator housing 14 results in the formation of a subassembly 15.

The upset tool is configured such that the heat staked portion has a surface 29 which is substantially flat. The distance between the inner surface 39 of the door panel 12 and the flat surface 29 of the heat staked portion 28 is H_A.

The window regulator housing 14 has a through hole 36 concentric with the protrusive part 18 to allow for the passage of a suitable fixing device such as bolt (not shown) as will be described further below.

Figure 4 shows an exploded view of an assembly 10, which includes the subassembly 15 and a drive mechanism in the form of a window regulator motor 16 (also known herein as a third component).

In further embodiments, the drive mechanism could be in the form of a manual window winder

The window regulator motor 16 has a cylindrical protuberant part 42, with an end surface 44 and a side surface 45. The window regulator motor 16 has an outer surface 38.

In this embodiment, the distance between the outer surface 38 and the end surface 44 of the protuberant part 42, is H_1 which in this case is equal to H_A, hence the end surface 44 is in contact with the flat surface 29 of the heat staked portion 28 and the outer surface 38 of the window regulator motor 16 is in contact with the inner surface 39 of the door panel 12.

Alignment in the Y direction is determined by contact between surfaces 44 and 29 and between surfaces 38 and 39, and is thus sensitive to any tolerances on the dimensions H_1 and H_A.

Consideration of Figure 4 shows that alignment in the X direction between the window regulator motor 16 and the window regulator housing 14 is provided by co-operation between the internal side walls 30 and the outside surface 21 of the protrusive part 18 and

also by co-operation between the inside surface 23 of the protrusive part 18 and the side surface 45 of the protuberant part 42.

A through hole 40 is located within the protuberant part of the window regulator motor 16, the hole 40 being aligned with the hole 36 of the window regulator housing 14. This allows for the passage of a suitable fixing device, such as a bolt (not shown), through hole 40 and hole 36, which can then be secured by a nut (not shown), thus securing the window regulator housing 14 to the window regulator motor 16.

With reference to Figure 5, there is shown an assembly 110 in which components that perform the same function as those in assembly 10 are labelled 100 greater. However in this case the protuberant part 142 has an end surface 144 and a side surface 145, with the distance between the end surface 144 and the outer surface 138 being H_2, which is less than H_A.

Alignment in the Y direction is determined by contact between the outer surface 138 and the inner surface 139, and there is no contact between the heat staked portion surface 129 and the end surface 144. Hence the alignment in the Y direction between the window regulator housing 114 and the window regulator motor 116 is only sensitive to tolerances on the thickness of the door panel 112.

Consideration of Figure 5 shows that, as in the previous embodiment, alignment in the X direction between the window regulator motor 116 and the window regulator housing 114 is provided by co-operation between the internal side wall 130 and the outside surface 121 of the protrusive part 118 and also by co-operation between the inside surface 123 of the protrusive part 118 and the side surface 145 of the protuberant part 142.

Furthermore in this embodiment the window regulator housing 114 does not include a hole equivalent to hole 36, and hence the window regulator motor is secured to the window regulator housing via a screw fastener such as a self tapping screw (not shown).

Thus it can be seen that it is the heat staked portion that is utilised to secure the window regulator motor 116 to the subassembly 115.

Note in this embodiment, the only contact between the window regulator motor and the window regulator housing is via the screw fastener.

In an alternative embodiment, the upset tool may be configured so as to provide a countersunk feature in the heat staked portion surface 129. This countersunk feature would then act to provide a lead-in for the screw fastener.

With reference to Figure 6 there is shown an assembly 210 including the subassembly 115 of Figure 5 and window regulator motor 216 having an outer surface 238 and a protuberant part 242 which has an end surface 244 and a side surface 245. The distance between the end surface 244 and the outer surface 238 is H_3, which is greater than H_A.

Alignment in the Y direction is determined by contact between the heat staked portion surface 129 and the end surface 244, and there is no contact between the outer surface 238 and the inner surface 139. Hence the alignment in the Y direction between the window regulator housing 114 and the window regulator motor 216 is not sensitive to tolerances on the thickness of the door panel 112.

Thus it can be seen that the window regulator motor co-operates with the heated staked portion to provide alignment in the Y direction between the window regulator motor and the window regulator housing.

Consideration of Figure 6 shows that, as in the previous embodiment, alignment in the X direction between the window regulator motor 216 and the window regulator housing 114 is provided by co-operation between the internal side wall 130 and the outside surface 121 of the protrusive part 118 and also by co-operation between the inside surface 123 of the protrusive part 118 and the side surface 245 of the protuberant part 242.

In this embodiment neither the window regulator housing 114, nor the window regulator motor 216 includes a hole, and hence the window regulator motor is secured to the window regulator housing at another position (not shown).

In an alternative embodiment the window regulator motor could be secured to the window regulator housing using a suitable adhesive between the end surface 244 and surface 129. Note in this alternative embodiment, there is no direct contact between the window regulator motor and the window regulator housing since there is a thin film of adhesive separating these components.

With reference to Figure 7 there is shown an assembly 310 including the subassembly 115 of Figure 5 and a window regulator motor 316 having an outer surface 338 and a protuberant part 342 which has an end surface 344 and side surface 345. The distance between the end surface 344 and the outer surface 338 is H_4, which is less than H_A.

Alignment in the Y direction is determined by contact between the outer surface 338 and the inner surface 139, and there is no contact between the heat staked portion surface 129 and the end surface 344. Hence the alignment in the Y direction between the window regulator housing 114 and the window regulator motor 316 is only sensitive to tolerances on the thickness of the door panel 112.

Consideration of Figure 7 shows that, as in the previous embodiment, alignment in the X direction between the window regulator motor 316 and the window regulator housing 114 is provided by co-operation between the internal side wall 130 and the outside surface 121 of the protrusive part 118 and also by co-operation between the inside surface 123 of the protrusive part 118 and the side surface 345 of the protuberant part 342.

It is important to recognise in this embodiment, that as previously described, the feature (in the form of the protrusive part 118) serves to align the door panel 112 (the first component) with the window regulator housing 114 (the second component), the protrusive part then being deformed to secure these components together to provide the subassembly 115. The

feature (the protrusive 118) co-operates with the window regulator motor 316 (the third component) to provide alignment between the second and third components.

In this case neither the window regulator housing 114, nor the window regulator motor 316 including a hole, and hence the window regulator motor is secured to the window regulator housing at another position (not shown).

Note that in further embodiments, the assembly is not restricted to door panels, window regulator motors and window regulator housings, and is equally applicable to assemblies in which at least two components are required to be aligned and/or secured relative to each other.

Furthermore other deformation techniques exist, such as the bombardment of the component by ultrasonic waves, to increase plasticity, followed by a suitable upset tool to achieve the desired final form. Alternatively it is also possible to mechanically deform the component without the need of an external energy source such as ultrasonic waves or heat. This would require a suitably configured upset tool and mechanical deformation process.

In further embodiments the deformed portion and/or alignment feature may be non-circular in cross section, e.g. hexagonal or square, as opposed to the cylindrical/frustoconical sections described in the embodiments of Figures 1 to 7. The use of non-circular cross sections would prevent rotation between the various components.

In further embodiments there could be two or three or four or more deformed portions and/or two or three or four or more alignment features. The deformed portions and/or alignment features are provided at spaced locations and thus prevent rotation of the various components. Where there are 3 or more deformed portions or alignment features these need not be positioned on a straight line.

Note that door panels 12 and 112 are in a substantially vertical plane, and the protuberant parts 42, 142, 242, and 342 are in shear, thus helping to support the weight of the window regulator motor 16, 116, 216 and 316.

In further embodiments the deformed portions could be integral with the first component or it could be a separate component such as a plastics rivet.

Claims

1. An assembly including a first, second, and third component, the first component being secured to the second component by a deformed portion to provide a subassembly, in which the third component cooperates with the deformed portion to provide alignment between the second and third components.

2. An assembly according to Claim 1 in which the co-operation between the second and third components is by engagement.

3. An assembly according to Claim 1 or Claim 2 in which the third component further provides a means for fixing the third component to the sub assembly.

4. An assembly including a first, second, and third component, the first component being secured to the second component by a deformed portion to provide a subassembly, in which the deformed portion is utilised to secure the third component to the subassembly.

5. An assembly according to any preceding claim in which the first component includes a feature which ensures alignment between the first and second components.

6. An assembly including a first, second, and third component, the first component including a feature which ensures alignment between the first and second components, the feature being utilised to secure the first component to the second component by a deformed portion to provide a subassembly in which the third component cooperates with the feature to provide alignment between the second and third components.

7. An assembly according to Claim 6 in which the third component further provides a means for fixing the third component to the subassembly.

8. An assembly according to Claims 5 to 7 in which the deformed portion is formed from a pre-deformed portion, the deformed portion cooperating with an associated region to provide the subassembly which during assembly of the first and second components, the

feature aligns the first and second components whilst the pre deformed portion is remote from the associated region.

9. An assembly according to any preceding claim in which at least one of the first second and third components includes a hole to allow passage of a fixing device.

10. An assembly according to Claim 9 in which each of the first, second and third components include a hole to allow passage of a fixing device

11. An assembly according to any preceding claim in which the second component includes a recess.

12. An assembly including a first component and a second component, the second component having a recess, with the first component being secured to the second component by a deformed portion, in which the recess includes the deformed portion.

13. An assembly according to any preceding claim in which the first component includes at least one protrusive part.

14. An assembly according to Claim 13 in which the protrusive part includes a straight portion and an angled portion

15. An assembly according to any preceding claim in which the second component includes at least one projecting pin.

16. An assembly according to any preceding claim in which the second component includes at least one internal side wall.

17. An assembly according to Claims 13, 14, 15 and 16 when dependant on claim 8 in which the pre deformed portion is the projecting pin, the associated region is the angled portion, the feature is the protrusive part, and the protrusive part aligns the first and second

components by engagement of the straight portion with the internal side wall prior to the projecting pin entering the hole of the angled portion.

18. An assembly according to Claim 16 when dependent on Claim 15 when dependent on Claim 11, in which the boundaries of the recess are defined by the internal side wall and the projecting pin of the second component.

19. An assembly according to any preceding claim in which at least one of the first, second, and third components is plastic.

20. An assembly according to Claim 19 in which one of said at least one plastics component is integral with the deformed portion.

21. An assembly according to any preceding claim in which the first component is a door panel, in which the door panel lies in a substantially vertical plane.

22. An assembly according to claim 21 when dependent upon claims 1 to 3 in which alignment is provided by an engaging formation, the engaging formation having some horizontal extent.

23. An assembly according to claim 21 when dependent upon claim 4 in which the third component is secured to the subassembly via a formation, the formation having some horizontal extent.

24. An assembly according to Claim 21 when dependent on Claims 5 to 8 in which the feature has some horizontal extent

25. An assembly according to any preceding claim in which the second component is part of a window regulator drive system mechanism such as a window regulator motor or a manual window winder.

26. An assembly according to any preceding claim in which the third component is part of a window regulator.

27. An assembly according to any preceding claim in which the deformed portion forms a seal between the first component and the second component.

28. An assembly according to any preceding claim in which the deformed portion is non-circular in cross section, so as to prevent rotation of at least one of the first, second and third components relative to another of the first, second and third components

29. An assembly according to Claim 6 or Claim 7 to 28 when dependent on Claim 6 in which the feature is non-circular in cross section, so as to prevent rotation of at least one of the first, second and third components relative to another of the first, second and third components

30. An assembly according to any preceding claim including at least one further deformed portion at a spaced location from said deformed portion in which the first component is further secured to the second component by said at least one further deformed portion.

31. An assembly according to Claim 6 or Claim 7 to 30 when dependent on Claim 6 including at least one further feature which is utilised to further secure the first component to the second component.

32. An assembly as herein before described with reference to, or as shown in Figures 1 to 4 or 5 or 6 or 7 of the accompanying drawings.

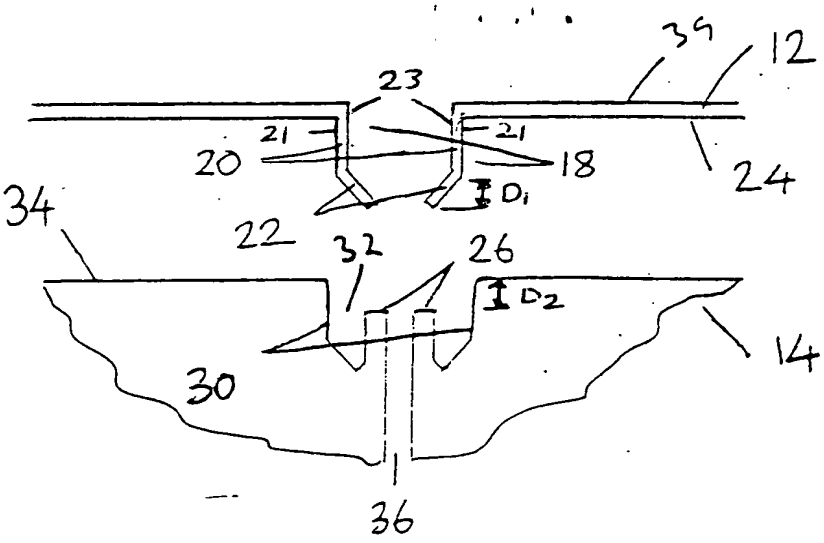

FIG-1

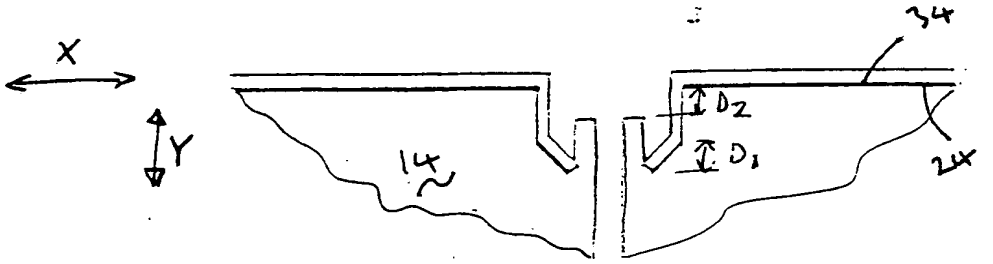

FIG-2

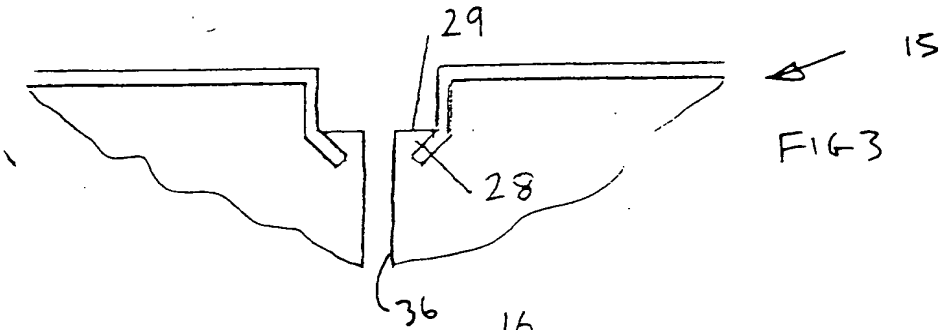

FIG-3

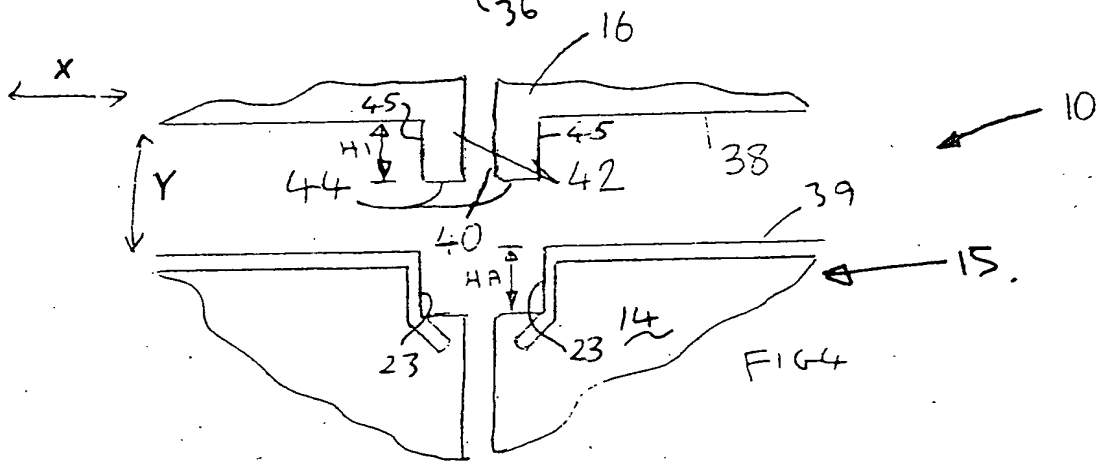

FIG-4

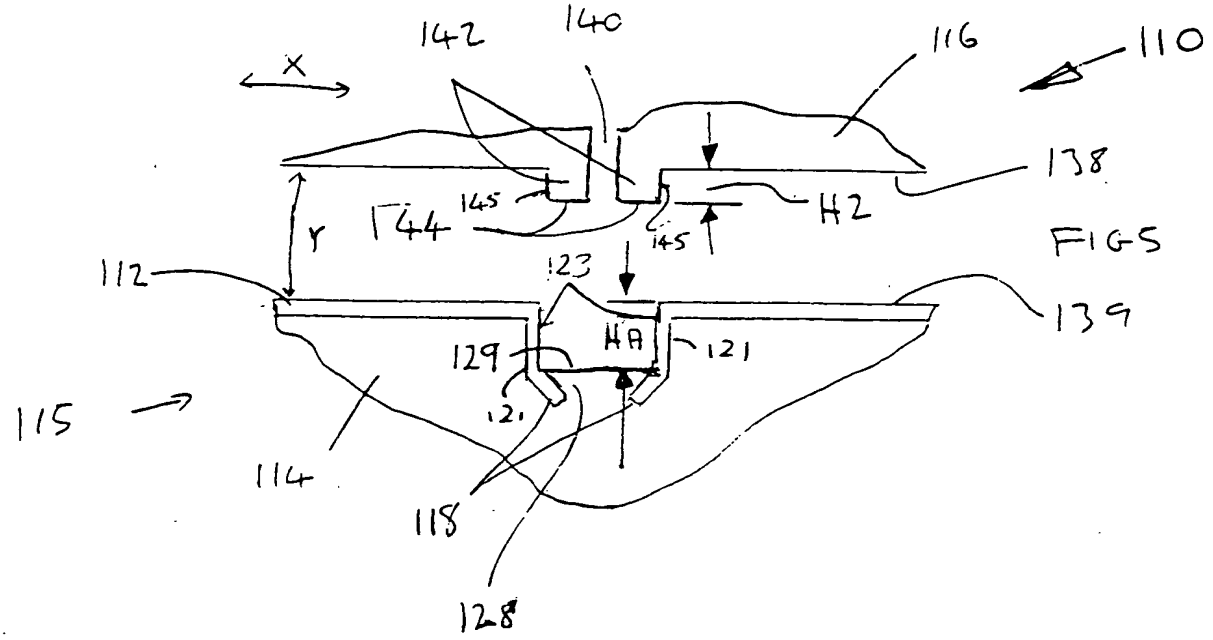
142
140
116
110
X
138
145
144
145
H2
r
112
123
139
129
HA
121
121
115
114
118
128

FIG 5

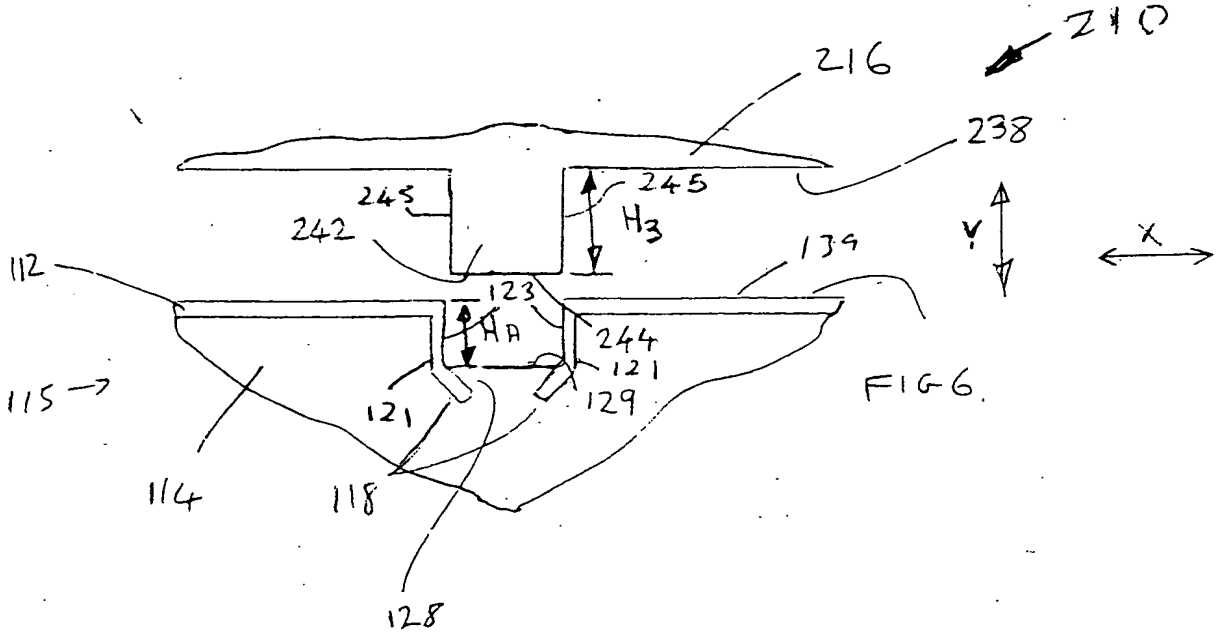
210
216
238
245
245
242
H3
Y
X
112
134
123
HA
244
121
115
121
129
114
118
128

FIG 6

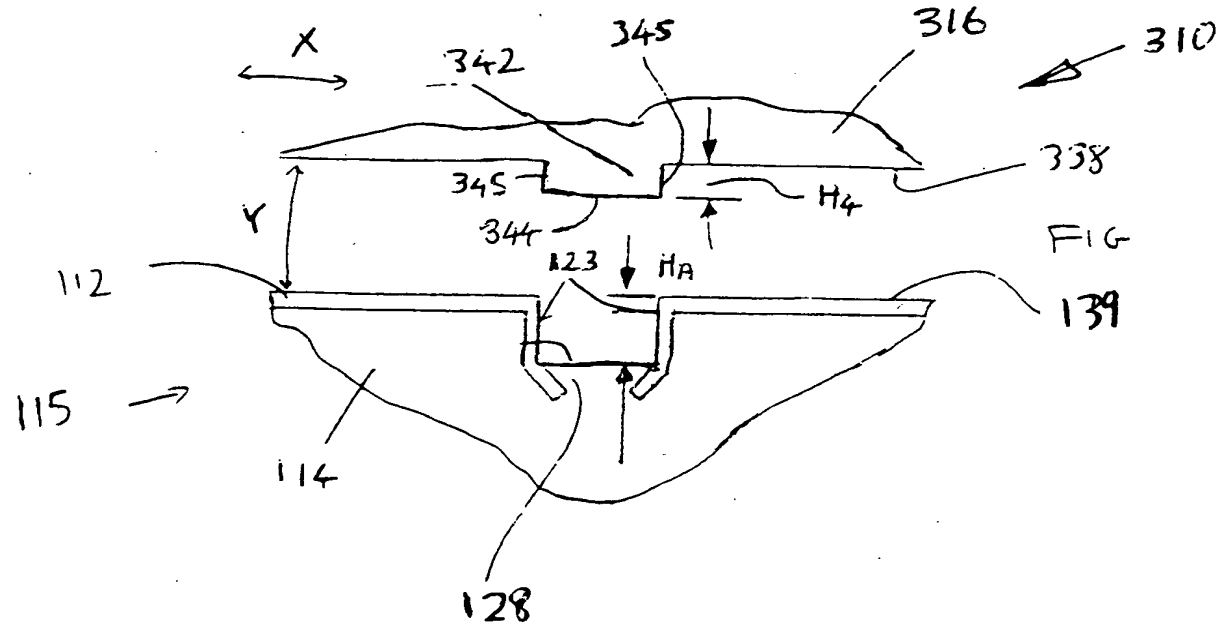

FIG 7